OUR BOOK SHELF.

Notes on the Use of the Portable Reversible Transit Instrument and the Method of Calculation of the Observations. By Captain C. E. Monro. Pp. 60. (London: J. D. Potter, 1911.) Price 3*s*.

This excellent little handbook is written to serve as a practical guide for the use of beginners with the transit instrument. After a very slight amount of personal instruction, the learner will find a sufficient aid in this book, which gives ample directions for securing the best possible determinations of time. The notes are written in a thoroughly practical manner; the whole procedure to be adopted in setting up the instrument and in making and reducing the observations is explicitly set forth.

Captain Monro is well qualified by experience for compiling such a handbook, having taken the principal part in the important longitude determination Greenwich-Ascension-Cape in 1907; but beyond his own observations, he has drawn largely on the accumulated experience of Greenwich observers during the series of fundamental longitude determinations made by the Royal Observatory. These notes may, in fact, be regarded as embodying in the main the practice actually employed at Greenwich. In one respect, however, a deficiency is apparent, namely, with regard to the observations which depend on the use of the Right Ascension micrometer. This is presumably owing to the author having gained his experience near the equator, where slow-moving polar stars are almost unobservable; in consequence, he himself would have little occasion for using the micrometer screw. To this we attribute the fact that there is no explanation of how to determine the value of the screw, a very important instrumental constant in time determinations under ordinary conditions. Further, the example given of the reduction of a slow-moving polar involves an extravagant amount of arithmetic, and an excessive number of decimal places are employed. It may also be remarked that the wire intervals are better determined from special observations of two or three polar stars than by the laborious process of reducing some hundreds of equatorial transits.

Apart from this the book contains all that is necessary for the most refined work with the type of instrument described. The appendix, containing specimens of computing forms for the reduction of the observations, is a useful feature. Another appendix contains an elementary account of the theory of the corrections for azimuth and level. A. S. E.

Elements of Zoology; to accompany the Field and Laboratory Study of Animals. By Dr. Charles B. Davenport and Gertrude C. Davenport. Revised edition. Pp. x+508. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1911.) Price 5*s*. 6*d*. net.

This attractive work was issued ten years ago by Dr. and Mrs. Davenport, and it has now passed into a revised edition. In the interval the author has taken charge of the Carnegie Institute for Experimental Evolution and of the Brooklyn Institute Laboratory at Long Island, and he is consequently well qualified to introduce changes in the work that reflect to some extent the advance of zoological knowledge so far as it affects an elementary text-book. The chief feature of the work is the abundance and excellence of the illustrations. Scarcely less striking than the figures are the suggestive and interesting remarks on the habits and behaviour of the examples selected. There is little plan or sequence in the chapters. Each of them consists of an isolated study of some particular topic associated with a given form of animal life. By some curious oversight only one-half of the selected forms are figured, though illustrations of related forms occur in abundance, and there are, in addition, photographs of the localities in which the chosen animals may be found. The work is so attractive and will be so useful to teachers who wish to organise nature-study courses that we are loth to point out the few blemishes that we have noticed. Darwin, however, would object to be quoted as saying (p. 171), or rather writing "mold" for mould, and "plow" for plough. The Ranidæ occur over Africa, and are not limited, as suggested on p. 348, to the northern hemisphere and East Indies. The spotted salamander figured on p 335 is called "A urode," a name which is certain to cause trouble and misunderstanding, as are many other curious vernacular names, such as "sow-bug" for Oniscus, "basket-fish" for branched Ophiuroids, "tumble-bugs" for the large dung-beetles, the "underwing" for Catocala, "spring azure" for blue Lycænas, and many others. Probably in the States these difficulties will not occur. We can heartily recommend this book.

Modern Industrial Chemistry, from the German of H. Blucher. Translated by J. P. Millington. Pp. xvi+779. (London: Gresham Publishing Co., 1911.) Price 30*s*. net.

This work is an attempt to survey the field of chemical technology and to bring the results within the compass of about 800 pages of well-leaded type. It is, lexicographically arranged, fairly well illustrated by "process" cuts, and plentifully interspersed with advertisements, or with references to the many advertisements between which the book itself is sandwiched. As might be anticipated from its origin, it deals mainly with German technology, and is especially rich in references to German patent literature. Another feature in which it differs from the ordinary run of such works is the prominence it gives to the nostrums and drugs with which modern chemical manufacturers, more especially in Germany, have flooded the markets of the world. Many of these are only of the most ephemeral interest, and certain of them are no longer in use, either because they have been found to be baneful, or because they have been superseded by others more convenient in use. As their names are to be found in modern pharmacological literature, and are presumably of interest to medical men, a catalogue of them, arranged alphabetically, may possibly be of some service. It must be admitted, however, that the information vouchsafed in the case of many of them is very meagre and not always authentic. Indeed, many of the titles in the book seem to be introduced for no other purpose than to direct attention to a trade advertisement.

The book may be of use in the counting-house of a manufacturer, but would be of very limited value to the specialist or the student of chemical technology.

Practical Plant Physiology. By Prof. F. Keeble, assisted by M. C. Rayner. Pp. xvi+250. (London: G. Bell and Sons, Ltd., 1911.) Price 3*s*. 6*d*.

Botanical physiology is one of the most instructive branches of science, because it provides an excellent test of a student's capabilities and is particularly suitable for inculcating the spirit of original research. Both these objects are kept in view by the author of this practical text-book, where they supply the main undercurrent flowing below the more obvious stream of information conveyed in the text. The course outlined is also thorough and complete, as the student is led systematically by argument and experiment through the sequence of problems connected with plant nutrition.

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Indeed, it will be speedily ascertained by those who start the course that the experiments indicated require considerably more time than is ordinarily devoted to this branch of botany; however, in this case there is no great objection to superfluity, as it is a simple matter to leave out those experiments considered to be less important. In the circumstances the author was well advised to touch only lightly upon the sensitivity of plants, which is discussed in the last chapter.

The general method of exposition is original, and a certain number of experiments, such as that devised by Dr. F. Blackman for illustrating the dependance of germination upon oxygen supply are additions to the courses generally followed in botanical laboratories. There is overmuch insistence on the correlation of guessing, reasoning, and trying, and perhaps a superabundance of chemical and physical tests. But these are minor matters of opinion, whereas there can be no question that the book is original, vigorous, and stimulating.

The Statesman's Year-Book. Statistical and Historical Annual of the States of the World for the Year 1911. Edited by Dr. J. Scott Keltie. Pp. lxxii+1412. (London: Macmillan and Co., Ltd., 1911.) Price 10*s*. 6*d*. net.

THIS is the forty-eighth annual issue of a work of reference which has become indispensable to administrators, statesmen, and students of economics and geography. The volume has been thoroughly revised and brought up to date—a preliminary section of additions and corrections including the results of the 1911 census of the United Kingdom. A series of new maps is provided, and these include maps of the new projected railway routes to India; railways, navigable waters, and steamship routes; the new Liberian Boundary, 1909; the northern territory of Australia; and of the Panama Canal from the latest reports of the Isthmian Canal Commission.

Several sections of the book have been greatly improved—those dealing with Turkey, Spain, and China may be mentioned. Altogether this issue of the "Year-Book" will preserve the high reputation the work has secured, and the editor may well be congratulated upon his efforts to maintain the accuracy and usefulness of the volume.

Catalogue of the Serial Publications in the Library of the Manchester Literary and Philosophical Society. Compiled, under the direction of the honorary librarian, C. L. Barnes, by A. P. Hunt. Pp. vi+177. (Manchester: Published by the Society, 1911.) Price 2*s*. 6*d*.

THE object of this catalogue is to make known the wealth of periodical scientific literature in the library of the Manchester Literary and Philosophical Society. The total number of current publications at present received by the society is 810, and they come from all parts of the world and cover every branch of science. The catalogue is excellently arranged, and is provided with an exhaustive index. It should be of great service to members of the society and to others engaged in scientific research.

The Lore of the Honey-Bee. By Tickner Edwardes. Pp. xx+196. (London: Methuen and Co., Ltd., 1911.) Price 1*s*. net.

THE first edition of Mr. Edwardes's book on the bee was reviewed in the issue of NATURE for November 5, 1908 (vol. lxxix., p. 6). This fourth edition is a cheap re-issue of what has already proved a popular work; and, at its present price, such an interesting history of the folk-lore of the bee and account of its activities should become known to a wider circle of readers.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Deformation of Rocks under Tidal Load.

I HAVE read with interest Prof. Milne's letter under the above title in NATURE of July 13, and congratulate him on the promising character of the results. As he himself remarks, the subject theoretically is not a new one. Its geophysical interest lies largely in the possibility of deriving information from the observed phenomena as to the elastic character of the earth's crust. Several difficulties, however, stand in the way of this information. The earliest mathematical treatment of the problem, so far as I am aware, is that by Sir G. H. Darwin, to which Prof. Milne refers. The problem which he actually solved relates to the effect of load on the surface of an elastic solid material which is *homogeneous, isotropic,* and *incompressible.* In ignorance of this solution, I obtained another[1] in 1896—a simple deduction from the important solution by Prof. Boussinesq for material bounded by an infinite plane—which is somewhat more general, in so far as it does not assume incompressibility in the material, but otherwise is subject to the same limitations. In practice, the most important of these limitations are probably the assumptions of homogeneity and isotropy. Very possibly, an expert mathematician familiar with recent developments of the mathematical theory of elasticity might have no serious difficulty in removing these restrictions in part or in whole. For instance, if a solution were obtained for the case where there is a relatively thin superficial layer differing in elastic quality from the remainder, it would immediately throw light on what is to be expected from differences in the surface strata.

The solution derived from Boussinesq's for the homogeneous solid is simple, the formula for the vertical component w of the elastic displacement at a point in the plane of the loaded surface being[2]

$$w=\{(1-\eta)/2\pi n\}\int\int(p/r)d\sigma,$$

where p is the normal pressure over the element $d\sigma$ of surface, situated at a distance r from the point where w is being measured, n denotes the rigidity, and η Poisson's ratio for the material, dw/dx gives the slope measured in the direction of the axis of x, supposed horizontal. We see at once that however complex the distribution of load may be, the slope varies directly as $1-\eta$, and inversely as n. For a given value of n it is 50 per cent. greater when Poisson's ratio is $\frac{1}{4}$—as it approximately is in steel—than when the material is incompressible.

There is, however, another aspect of the case that has to be taken into account. The influence of the tide does not consist solely of the pressure effect. At high-tide we have a large additional quantity of gravitating material, the attraction of which modifies the direction of gravity at the land station. If we compare the readings of a delicate spirit level at mid-tide and at high-water, there is an apparent change of level $\psi_1+\psi_2$, made up of ψ_1 due to the actual slope of the surface carrying the level, and ψ_2 due to the alteration in the direction of local gravity. Under the conditions postulated in my solution of the problem

$$\psi_1/\psi_2=2(1-\eta)g\rho a/3n,$$

where g is gravity, a the earth's radius, and ρ its mean density. The ratio varies enormously for values of η and n that exist in known materials. Thus we have, measuring n in grammes weight per sq. cm.,

$$\begin{array}{llll}\eta=0{\cdot}25, & n=80\times10^7, & \psi_1/\psi_2= & 2 \text{ approximately,}\\ \quad=0{\cdot}5, & n=11\times10^7, & \quad=11 & \quad\text{,,}\end{array}$$

The first thing to be considered is what does the instrument used actually record? Is it ψ_1 or $\psi_1+\psi_2$? In the latter event, unless ψ_2 is relatively negligible, we must

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[1] See *Phil. Mag.*, March, 1897, p. 173.

[2] Proc. Physical Society, vol. xv., p. 36, and *Phil. Mag.*, *l.c.*, p 177.

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